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Governing Embedded Partner Networks: Certification and Partner Communities in the IT Sector

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Abstract

Purpose

The complexity of supplier-partner networks in the Information Technology (IT) sector where large suppliers utilize thousands of authorized partners, requires that organizations reconsider their approach to governing and managing the relationships involved. Traditional dyadic approaches to governance are likely to prove inadequate. This paper investigates the relationship between network governance mechanisms and relationship performance. Specifically, we examine the contingent effect of certification of partners and the use of partner communities (as formal and informal mechanisms of network governance, respectively), on complex and embedded networks of relationships.

Design/methodology/approach

A model examining the effect of formal and informal network governance on the relationship between embeddedness (structural and relational) and relationship performance is developed. Data was collected from a sample of partners of leading IT suppliers in the United Kingdom and Ireland. Three-way interactions assess the contingent effect of certification and partner communities on the relationship between embeddedness and relational performance.

Findings

Results support the use of a combination of certification and partner communities to strengthen the link between network structure (structural embeddedness) and relational embeddedness, as well as relationship performance. Certification requires the sharing of explicit knowledge with partners whereas partner communities aid the creation and dissemination of more tacit, contextual knowledge. Furthermore, partner communities reinforce positive perceptions of fairness in suppliers' network management practices, overcoming any perceptions of lock-in or coercive control that certification may suggest.

Practical implications

Certification, despite all its procedural and reputational benefits, damages partner relationships and needs to be supported by partner communities, which themselves show particularly strong benefits in enhancing network relationships.

Originality/value

Despite the emerging prevalence of certification and partner communities in business-to-business relationships, to date there is a paucity of research on their effects on partner relationships and performance. Organizations with an extensive network of similar partners may suffer network overload. This research shows that such organizations can manage their partner network more effectively through network governance mechanisms, thereby addressing the challenge of overload.

Keywords: Governance; Partner Networks; Certification; Communities

Introduction

For large Information Technology (IT) suppliers, such as Microsoft, Cisco, IBM and Oracle, the creation of value depends largely on vertical networks and effective management of relationships with independent partners (de Ruyter et al., 2001; Gilliland, 2003). The vertical network consists of a lead supplier organization and numerous smaller partner organizations through which it sells and delivers IT hardware (e.g. computers, servers and network equipment) and/or software products. All major activities and key decisions are managed by the supplier; still its success in the market is heavily influenced by the efforts of its partners. For instance, two-thirds of the total revenue of SAP, one of the world's largest inter-enterprise software suppliers, is driven by their worldwide channel partner network (Whiting, 2013), whilst Cisco, a leading supplier of networking and telecommunications hardware, derives over 80% of its revenues through its 55,000 partners (Kalyanam and Brar, 2009). Beyond their direct impact on revenues and margins, these channel partners are a critical source of market intelligence, co-creation and market development for suppliers (Sarker et al., 2012). However, despite the importance of these relationships there is a lack of research to help managers (Lee and Joshi, 2011).

Despite their wide-spread popularity in the IT sector, organizations are increasingly dissatisfied with the return on investment from channel partner programs (Neumann et al., 2015). Furthermore it is often suggested that more effective relationship management and engagement with these partners is needed to alleviate their mistrust in how suppliers engage and manage partners (Andrews, 2013). Evidence suggests that the scale and complexity of partner networks, in the IT sector, requires a governance approach that is more nuanced than the dyadic, control-based approaches traditionally adopted (Zarges, 2012). We assert that there is a clear managerial need to explore the impact of governance approaches that are focused on the management of the network, rather than multiple individual relationships.

We examine recent theorizing on relationship governance to address this need. The term *governance* refers to the processes that are needed to structure economic and social exchanges, and the control mechanisms used to maintain them (Heide, 1994). As such, governance has an important impact on the performance of inter-organizational relationships (Jap and Ganesan, 2000). Existing research on governance mechanisms in vertical channels has focused primarily on the management of individual relationships. However, it has been argued that this approach may not be effectively scalable, as relationships are typically embedded in more complex multi-stakeholder networks (Provan and Kenis, 2008; Zu and Kaynak, 2012). Partners in these networks can be managed more effectively through governance mechanisms aimed at enhancing the network as a whole thereby avoiding the challenges associated with trying to manage many partners individually (Dagnino et al., 2016).

IT suppliers have recently advanced two contrasting mechanisms to collectively govern their large-scale partner networks: (1) the certification of partners; and, (2) the establishment of partner communities via online interactive forums. Certification, which is the standardized and formalized process of validating the authenticity of a partner's resources and knowledge, legitimises partners relative to the network (Graffin and Ward, 2010). Partner communities are a form of network of practice where the social structure of the community and partners' concern for reputation within the community serve to informally govern the network (Capaldo, 2014; Wasko and Faraj, 2005).

While exploring both mechanisms, the context in which the relationship is embedded must be considered also as channel partners are embedded within a broader social network that will influence how they conduct and manage their cooperative relationships (Gnyawali and Madhavan, 2001). There are two main classifications of embeddedness - structural embeddedness and relational embeddedness (Kim, 2014). Broadly summarised, structural embeddedness focuses on who knows whom, whereas relational embeddedness captures how

well actors know each other (Moran, 2005). Specifically, structural embeddedness relates to the specific configuration of channel partners selected by the supplier and highlights the importance of framing partners as being embedded in larger networks rather than in isolation (Choi and Kim, 2008). Relational embeddedness refers to the closeness of bonds and shared goals between partners, and the expectation of reciprocity and relationship continuation (Carey et al., 2011; Rindfleisch and Moorman, 2001). Currently, there is little agreement in the literature pertaining to the compatibility of formal and informal governance mechanisms, i.e., whether they operate more effectively as substitutes or complements, within the context of network embeddedness.

The aim of this paper is to explore how certified partners in the IT sector are governed by their suppliers and the effect this has on their performance. We present a theoretical model that examines how the structural configuration of the partner network (the level of structural embeddedness) impacts relational performance, both directly and indirectly through relational embeddedness. Taking a plural form perspective on governance, we assert that partner certification and partner communities (formal and informal governance respectively), reinforce the impact of structural embeddedness on the strength of the relationship (relational embeddedness) between supplier and partner and subsequently on relationship performance. We contend that when certifications are combined with the informality of a partner community, they have a complementary effect. Although the certification process can foster negative sentiments when perceived as a form of coercive control, or monitoring of partners, it does generate explicit knowledge for the partners whereas a partner community provides more tacit contextual knowledge and reinforces the social norms which bind partners. Furthermore, partner communities reinforce positive perceptions of fairness in suppliers' network management practices overcoming any perceptions of lock-in that certification may suggest.

Frame of Reference

Governance of partner networks in the IT sector

For large IT hardware and software suppliers the design and installation of complex solutions are typically led by value adding partners (Kalyanam and Brar, 2009; Lee and Joshi, 2011). Most suppliers manage thousands of geographically dispersed small to medium sized partners (Gillilan, 2003). Cognizant of the importance of channel partners, suppliers are investing heavily in the management and maintenance of these strategic relationships. For instance, HP invested \$1.5 billion in the launch of its PartnerOne program and recently IBM re-designed PartnerWorld University to educate their 155,000 partners in critical sales and technical skills. These partner programs are used to support specific partner segments, offer online training for professional advancement and certification tracks, and facilitate peer-to-peer knowledge and social exchange (Pelser et al., 2015). However organizations are increasingly dissatisfied with their returns from partner programs and require guidance in the management of these critical relationships (Lee and Joshi, 2011; Neumann et al., 2015).

In IT supplier-partner networks suppliers face the daunting task of governing a network of tens of thousands of partners. Partnership governance mechanisms are the means by which a supplier attempts to align their partners' practices with its goals (Heide, 1994). This can be achieved through either regulating the partners' practices using formal governance mechanisms or influencing their behavior using more informal mechanisms. Existing theorized approaches to governance work at the level of the individual relationship and may not be scalable as the number of partners increase (Provan and Kenis, 2008). In addition, individualised contracts and the establishment of interpersonal contacts does not account for the partners as part of an ecosystem. As a result organizations with an extensive network of interconnected partners may suffer network overload, which can curtail the effectiveness and efficiency of the network (Dagnino et al., 2016). Rather IT suppliers can manage their partners more effectively through

specific governance mechanisms that aim to enhance the performance of both the individual partners and the network as a whole.

Therefore IT suppliers have introduced two contrasting mechanisms to manage their networks - the *certification of partners* and the establishment of online *partner communities*. Despite the emerging prevalence of these two network governance mechanisms there is a paucity of research on their effects on partner relationships and relationship performance.

Certification is the standardized and formalized process of validating the authenticity of the partner resources and skills (Modi and Mabert, 2007). Certification governance includes two fundamental elements - a codified set of standards and a certification system that allows organizations to communicate the attainment of these standards (King at al., 2005). To be “certified” in the IT sector, partners are required to have a number of pre-defined resources, a minimum acceptable level of technical knowledge and must undertake training in the products of the supplier (Gilliland, 2003; Palotie 2017; Wang and Philips, 2012).¹ This is backed up by competence testing. Cisco’s experience is that training that is not validated with competence testing is not effective (Kalyanam and Brar, 2009). Certifications are particularly effective at the network level as they allow suppliers to strengthen a large number of their partner’s capabilities efficiently (Kalyanam and Brar, 2009).

Being certified signals to the marketplace that a certain level of competence has been reached in the supplier’s products, underlining the brand promise of the supplier (Kalyanam and Brar, 2009; Kirmani and Rao, 2000). Certification programs usually have tier levels representing partners’ capabilities. For example, SAS (a provider of analytics software) has silver, gold and platinum partners (SAS, 2017). Advancement from one tier to the next is determined by the number of employees who have passed SAS’s certification exams and the

¹ This differs from the certification of quality management systems e.g. ISO 9001 which typically focuses on processes and are managed by third party organizations independent of the parties involved in the relationship. We thank the anonymous reviewer for this clarification.

taking of specific training courses. These partners can further differentiate themselves in the marketplace by obtaining specialization badges representing specific competencies

IT suppliers provide online partner directories listing all certified partners and detailing their capabilities. This leads to positive reputational and legitimacy effects with end customers and other partners. Partners use certification information to identify other partners who share similar standards and with whom they may want to work with (Wang and Philips, 2012). Partners' desire to acquire legitimacy sees certification act as a governance mechanism over the network (Capaldo 2014; Provan and Kenis, 2008). Achieving legitimacy in the market is the primary reason for partners to pursue certification (Lee and Joshi, 2011).

To complement the certification process, and acknowledging that online communities can enhance B2B relationships (Andersen, 2005; Spralls et al., 2011), companies such as Intel, HP and Oracle have introduced online communities of practice. These partner communities play an important role due to the guidance offered, knowledge available, and technical support that partners can leverage (Bone et al., 2014; Graham and Hardaker, 2000). For example Microsoft Dynamics partner community has been set-up to allow partners to interact with each other; to post and answer questions; to get help from experts; and, to access useful videos and 'how-to' articles (Microsoft, 2017). Partners are encouraged to post regular support and how-to blogs on the community forum. Blog articles are seen as an effective way to help answer questions, give tips, provide advice and highlight the expertise of community members.

These communities have now become the main repository for information regarding a supplier's products, along with demonstrations and relevant training. The online message boards and chat rooms of the communities help to establish flows of information and facilitate on-going communication (Wuyts and Geyskens, 2005). Partner communities bring individuals, who have commonalities around a shared practice, together to exchange knowledge and expertise in order to improve and generate economies of expertise, whilst also collectively

generating solutions to shared problems (Spralls et al., 2011; Wasko and Faraj, 2000). Suppliers often encourage the development of regional sub-communities, or user groups based around specific competency areas, which further increases the relevance of the community to individual partners.

The communication and knowledge sharing in these partner communities inspires confidence, generates a willingness to collaborate for mutual benefit and fosters commitment (Matzat, 2004; Wasko and Faraj, 2005). Cisco publicizes partner-led solutions in its online community and provides rewards for partner-led solutions as community building measures (Kalyanam and Brar, 2009). To encourage engagement with the community, contributors to Cisco's community can be awarded VIP status or elected to the Hall of Fame, based on the quality of their contribution and influence within the community (Cisco, 2017). Badges and awards are also given for those who provide leadership and commitment to their peers. Partners who make a significant contribution to the Microsoft Dynamics community (answering questions and participating in discussions) are asked to play a moderation role whereby they monitor and maintain the quality of the interaction (Microsoft, 2017). These are valued by the community as they are seen as independent voices who provide different perspectives. Other members of the community recognize community moderators as experts who have been promoted in recognition of their passion for the community.

Via community engagement, the normative influences of the community become ingrained, reflected in voluntarism, trust, concern for reputation and reciprocity (Mathwick et al., 2008; Capaldo 2014; Wasko and Faraj, 2005). Through the positive reinforcement of shared values, and the development of a cohesive social structure within the community, participants' behavior is directly affected (Geyskens et al., 1999; Jones et al., 1997). It for these reasons that Grewal et al. (2010) position the establishment of network communities as an important informal governance mechanism.

Embedded networks

In examining governance effectiveness, we acknowledge that relationships do not exist in a vacuum but rather that they are embedded within a complex network of social, economic and hierarchical structures (Bradach and Eccles, 1989). The supplier-partner context positions partners as embedded in a network of other partners that have been selected and certified by the supplier for whom they are acting as a sales agent. Through the embeddedness perspective we are able to consider how partners are effectively coordinated and managed by their supplier in order to improve relational performance.

Following Granovetter (1992) we conceptualise embeddedness at two levels: the structural level and the relational level. Nahapiet and Ghoshal (1998) define structural embeddedness as the impersonal configuration of linkages between people or units, whilst Choi and Kim (2008) assert that structural embeddedness is the framing of partners in relation to the network in which they reside. We align with the latter definition as it enables a more rigorous examination of the complexity of the context that we are studying – that of large supplier-partner networks. In the IT sector, we contend that an organization's performance depends on how it environs itself with other companies. In line with Burt's (1992) structural hole approach, this conceptualization of structural embeddedness, also allows us to consider the impact of dependency between suppliers and partners in the network and examine the effects of efforts made by suppliers to structurally plan the positioning of their network. Structural embeddedness can shape the informational and reputational benefits flowing to actors within the network, and develop their competitive potential (Kim, 2014). The configuration of the partners in a network and the way in which they interact with one another influence the flow of resources, status and benefits that accrue between them and their supplier.

The second type of embeddedness, relational embeddedness, refers to the intensity and intimacy of bonds organizations have forged with each other through a history of interactions

(Granovetter, 1992; Nahapiet and Ghoshal, 1998). Mutual trust, respect, commitment and a sense of obligation shared between actors are the central tenets of relational embeddedness (Lawson et al., 2008; Moran, 2005; Rindfleisch and Moorman, 2001). As a form of credible assurance for both parties, relational embeddedness offers confidence and reduces the fear of opportunism in the exchange process (Dyer and Singh, 1998; Kim, 2014). When two actors are relationally embedded, both parties are more trusting and more familiar and will have increased opportunity to learn from one another. This informed position will, in turn, increase both actors willingness to share information and resources, and cooperate for mutual gain. It follows that relational embeddedness improves relationship performance by reducing the expectation of opportunistic behavior in the network, helping partners and suppliers to more effectively combine knowledge across the network (Kim, 2014).

Conceptual Model and Hypotheses Development

We hypothesize that a base model of *structural embeddedness – relational embeddedness – relationship performance* (Gnyawali and Madhavan, 2001; Kim, 2014) will be affected by the governance mechanisms that partners are subjected to (see Figure 1).

*** Figure 1 About here ***

Research has shown the positive impact of structural embeddedness on performance (Moran, 2005; Kim, 2014; Zaheer and Bell, 2005). Past studies have also shown that structural embeddedness is positively related to relational embeddedness (Li et al., 2014; Zaheer and Bell, 2005; Roden and Lawson, 2014). Furthermore, relational embeddedness which manifests itself in trustworthiness, promotes cooperative behavior and resource sharing, and partially mediates the relationship between partner network structure and relationship performance (Carey et al., 2011; Kim, 2014). As these relationships are already established in the literature we do not present formal hypotheses, but position these relationships as the base model upon which governance operates. We then focus on the moderating effects of certification, a formal

approach to governance, and informal governance, embodied in a partner community, on the relationship between embeddedness and relational performance.

Initially, the predominant perspective in governance research was that formal and informal governance mechanisms work more effectively as substitutes of each other (e.g. Dyer and Singh, 1998; Gulati and Singh, 1998). More recently, this assertion has been challenged by the plural form perspective, which contends that both types of governance offer discernible benefits when used in conjunction with one another, and should thus be considered complementary (Bradach and Eccles, 1989; Li et al., 2010; Yu et al., 2006). However there is still a need to investigate the relative substitutive or complementarily effect of alternative governance mechanisms, especially across different relationship contexts (Wacker et al., 2016). In addition, the conceptual development of network governance mechanisms is still in the early stages. We argue that the performance of partners can be bolstered by purposefully combining certification with the establishment of a partner community. As we now explain, partner communities can enhance the usefulness of knowledge generated by certification and can offset some of the limitations of certification on relational embeddedness.

Moderation of the Structural Embeddedness-Relationship Performance Path

Certification and partner communities can help strengthen the relationship between partner network structure and relationship performance by enhancing the flow of both explicit and tacit knowledge to the partner. Moreover, the pattern is likely to be similar to that suggested by Bell et al. (2009): Certification, as a formal control mechanism, is likely to have a greater role in safeguarding the investments that enable the flow of explicit knowledge, whereas the partnership community (as informal governance) is more critical to the diffusion of tacit knowledge. Thus, their role is complementary.

With respect to explicit information, the certification process sees suppliers establish requirements for partner organizations to achieve a certain level of proficiency or possess a

specific knowledge set across their line of products. The standards applied, coupled with the formal auditing procedures involved, offer a template for enabling the transfer of explicit knowledge across the network (Li et al., 2010) thus strengthening the impact of structural embeddedness on relationship performance. Certification allows a supplier to formally increase the capabilities of a significant number of partners (Kalyanam and Brar, 2009) and can thus raise the effectiveness of the whole network.

Within the context of supplier-partner networks, online communities have been shown to be very effective in providing guidance, relevant information and technical support to partners (Graham and Hardaker, 2000). This may be partly due to the fact that these communities allow partners to access knowledge that does not reside in their own organization but resides within the network as a whole (Anand et al., 2002). Partners in the network have overlapping expertise and technological knowledge and therefore will be able to benefit from the sharing of information and experiences through partner communities, generating economies of expertise in the process (Jones et al., 1997; Spralls et al., 2011) and enabling partners to solve problems more efficiently (Bone et al., 2015). Thus partner communities will also increase the effectiveness of the partners in the supplier's network.

However, we contend that certification and partner communities work to synergistically enhance the performance of the network in two ways. First the relative openness and informality of partner communities encourages behavioral transparency and trust development which enables the free-flow of information and problem solving across the network. Complementing this, certification helps partners achieve legitimacy and status (Suchman, 1995; Graffin and Ward, 2010) by signalling the achievement of a level of knowledge (Brunsson et al., 2012). Thus certification reduces information asymmetries between partners (King et al., 2005), provides protection against free-riding and enables smoother communication flows. Reducing information asymmetry between partners enhances

voluntarism and reciprocity in communities (Mathwick et al., 2008). Together certification and partner communities set the stage for the smoother generation and flow of knowledge enhancing relationship performance.

Second, partner communities are important for the sharing of tacit knowledge enhancing the usefulness of the certified explicit knowledge partners possess. This is because a partner community can be a powerful source of information around shared, unspoken rules for behavior which strengthen the capabilities of partners. Similar to Jap's (1999) social interaction routines, partner communities provide a forum for partners and suppliers to share trouble-shooting tips and hands-on experience (Anand et al., 2002). Even though the participating organizations may be direct or indirect competitors, informal and reciprocal knowledge exchanges between individuals are valued and sustained over time because the sharing of knowledge is an important aspect of being a member of the community (Bouty, 2000; Mathwick et al., 2008). The community establishes a common language to convey complex information and specifies shared tacit rules for behavior (Jones et al., 1997).

Explicit knowledge exchange is most efficient when community members have similar narratives and contextual framing (Wasko and Faraj, 2000). Tacit knowledge enables partners to overcome cognitive barriers, and thus assimilate and make full use of explicit knowledge (created by the certification process). The partner community also allows partners to address any misunderstandings that they may have accrued during its acquisition. It is the interaction of tacit and explicit knowledge that is important in creating a higher and richer level of knowledge enhancing the usefulness of both (Nonaka, 1994).

Thus we assert that:

H1: Governance through certification and partner communities synergistically and positively moderate the relationship between partner network structure and relationship performance.

Moderation of the Structural-Relational-Relationship Performance Path

The implications of certification and partner communities on the relational aspects of the base model are less clear. Research has questioned the value of certification for supplier performance (Krause et al., 2007). On one hand, the formalized processes associated with certification sets standards and routine procedures for every partner to follow and abide by, thus creating less confusion and reducing divergent interpretations of similar activities (Kalyanam and Brar, 2009). However, Blonska et al (2013) showed that certification has a negative impact on the quality of the relationship. Such a formalized, one-size fits all means of governance can aggravate asymmetries in channel perceptions and information flows, causing resentment and actually reducing coordination (Gilliland et al., 2010). This points to a darker side of certification where it may be perceived by some as a coercive influence attempt. Coercive influence mechanisms apply direct pressure by communicating the possible negative consequences of non-compliance to encourage specific behaviors (Frazier and Rody, 1991).

Certification, whilst it may confer positive informational benefits, can be viewed as a form of unilateral control, in favour of the supplier, limiting partner autonomy and increasing conflict, often leading to defensive or opportunistic behavior (Brown et al., 2009). Furthermore, the monitoring aspect of certification may signal supplier distrust and lack of confidence in the partners' attributes (Poppo and Zenger, 2002), impeding cooperative behavior (Huang et al., 2014). These factors may mean that certification can destabilize the relationship suggesting a limit to the impact of certification on relationship embeddedness and performance.

Conversely, an effective partner community increases the perception of transparency and fosters positive perceptions of fairness in suppliers' network management practices. As a governance mechanism, it is targeted towards increasing total value rather than share of value (Burkert et al., 2012). The community provides the opportunity and motivation to strengthen the interactions, through improved communication and understanding of the other partners in

the network (Yu et al., 2006). Relational embeddedness is tightly linked with the norm of helping each other on online networks (Matzat, 2004). Even the sole act of sharing information in online communities increases relationship commitment (Weber, 2001). Still, the social support available through these communities has an even more significant effect on commitment (Mathwick et al., 2008). The community creates a convergence of expectations through socialization (Jones et al., 1997). When collaborations are ingrained in a cohesive social partner community, the partners' concern for reputation within the community, acts as a governance mechanism (Capaldo, 2014). The community supports embedded social relationships that help mitigate the risks associated with opportunistic behavior (Grewal et al., 2017). This not only strengthens existing relational embeddedness but can also directly improve the knowledge benefits of collaboration, as well as performance more broadly (Wasko and Faraj, 2000).

However, the benefits of certification and partner communities on the relationship can be further understood by considering their synergistic effects. Whilst evidence has shown that simultaneously investing in relational ties between actors, and imposing evaluation and certification expectations, creates ambiguity and a disconnect in the relationship (Wagner, 2010), we suggest that the socialization, information transparency, knowledge sharing and troubleshooting opportunities offered in partner communities, offset potential adverse reactions to certification (such as perceptions of lock-in, control and monitoring).

Partner communities elevate the efficiency of certification through the sense of “community” created while at the same time countering perceptual consequences of the monitoring efforts of the supplier (Bell et al., 2009). In this way, we contend that partner communities operate as a type of social control which buffer against, and neutralize, a partner's potentially negative sentiments and adverse reactions to the certification process (Brown et al., 2016). The relationships fostered in these communities encourage social cohesion, with the

ongoing interaction serving to support and reinforce norms of behavior, which effectively act as a self-enforcing safeguard (Heide, 1994). Supporting this, Osmonbekov et al. (2016) found that formal governance in the form of contracts exasperates a partner's perceived inequity whereas social enforcement, captured as norms of behavior, reduces it.

At the same time certification can support the effectiveness of the partner community. Certification allows for a specific form of trust to develop in the online partner communities; the trust of belonging to the same organizational network (Grabner-Krauter, 2009). Spralls et al. (2011) found the degree to which partners have confidence in the reliability and integrity of other network partners a key element of an online community's ability to build closer relationships with partners. Similarly, Markus and Agre (2000) state that for virtual organizations in the open-source context, "a large 'community of practice' with a strong, shared technical professionalism" is needed. Certification, by definition, is the affirmation of such technical professionalism which reinforces partners' commitment to the community enhancing its effectiveness. Thus, while certification on its own may have a dark side, when used in conjunction of a partner community, it will strengthen the benefits of the latter.

We hypothesize:

H2: Certification and partner community governance synergistically and positively moderates the relationships between, (a) partner network structure and relationship embeddedness, and (b) relationship embeddedness and relationship performance.

Methodology

Measures

To test the conceptual model a survey was carried out. Where possible, scales from previous research were used and adapted to the specific context. The scales for the two governance mechanisms were developed specifically for this research. Items for the scales were based on the literature reviewed. Exploratory interviews, lasting 60-90 minutes, were

conducted with a group of 11 senior managers from a mixture of supplier and partner firms. All practitioners were experts with considerable experience in managing the affairs of partner organizations for at least two years in this field. Their feedback helped us revise the questionnaire, shape the conceptual model and purify the items. Their interpretation of the items in the measures helped ensure the content and face validity of each measure. The final questionnaire was pretested with a holdout sample of 31 managers from partner firms which helped further purify the measures and indicated that the items in the final survey instrument were reliable and valid (Gilliland and Bello, 2002). All scale items were assessed on 7-point Likert scales (see the appendix for a complete list of measures).

Certification governance was based on the existing research on certification (Blonska et al., 2013; Krause et al., 2007; Modi and Mabert, 2007) and refined via interviews with managers. This scale was assessed on four items: our supplier requires us to have substantial resources (i.e capital, number of employees) in place before being granted certified status; requires our employees to demonstrate a high level of knowledge (e.g via examinations, test, qualifications etc.) before being certified; requires our employees to undertake specified training; our supplier regularly reviews our certification status.² The scale reflects the elements commonly associated with certification programmes in the IT sector, a resource or capability requirement; a training requirement; a formalized process of assessment, and a monitoring programme (Gilliland, 2003; Kalyanam and Brar, 2009).

Partner community governance refers to the totality of effort exerted by the supplier to create an online community of practice which allows partners to interact, collaborate on problem solving, exchange knowledge and expertise, and form cooperative connections

² One item - certification level is a key influence amongst customers in our market - was removed after feedback from managers. This were not deemed to be part of the governance aspects of certification.

(Graham and Hardaker et al., 2000; Mathwick et al. 2008; Wasko and Faraj, 2005). This scale was based on the scale for online community building from Grewal et al. (2010) and interviews with managers which stressed the importance of online communities for information sharing and for discussions between peers for troubleshooting. Partner community governance was measured using four items that assessed the extent to which partners were encouraged to interact and share information amongst each other; the existence of discussion forums to enable information sharing; the value partners place on discussions with other partners, and the belief that partners were cooperative rather than competitive.³

Relationship performance is defined as a channel member's evaluation of the economic outcomes that flow from the relationship with its partner (Geyskens et al., 1999). Relationship performance was measured using a three item scale developed by Nyaga et al. (2010).

Relationship embeddedness, which reflects the closeness of bonds between the partner and their supplier, was captured using a four-item scale from Rindfleisch and Moorman (2001).

Partner network structure is the extent to which a partner feels it is deeply and fairly embedded in a network of partners. Building on the work of Anderson and Weitz (1992), partner network structure was measured by 4 items that assess partner's perception of their supplier's effectiveness in planning and managing its network of partners, designating their territories and avoiding direct competition between partners.

In addition, a number of variables that may influence relationship performance were included in the tested models. The tier level of the partner was measured on a 3-point scale (entry/foundation-, mid-, and top-tier level partners) as this often determines the level of support a partner receives (Kalyanam and Brar, 2009). Partners were asked to indicate if the proportion of their total revenues' from the specified supplier was greater or less than 50% as

³ One item - there is good sense of shared belonging amongst the partners of our supplier – was dropped after the pre-test.

a measure of the partner's dependency on the supplier which may affect business to business relationships (Gilliland and Bello, 2002). The length of the relationship and the size of the partner organization (measured using number of employees) were also controlled for as these can affect embeddedness and relationship performance (Kim, 2014; Poppo and Zhou, 2014). The type of product (hardware versus software) was also controlled as the relative importance of certification and online communities of practice may increase with more information intense products (Spralls et al., 2011).

Sampling

The empirical part of this study was carried out via a key informant survey. Partners were identified from websites of leading IT companies⁴. Data was collected from the United Kingdom and Ireland. Partner directories on the IT firm's websites were used to identify appropriate partners and contact information. Where possible, direct contact with firms was made to check the identity of the most appropriate informant. Informants needed to have had experience with the supplier for at least one year and be in a position whereby they dealt with the supplier organization directly. In the cases in which such a key informant was not identifiable, the firm was excluded from the sample. 720 certified partners were identified. The final questionnaire was pretested with a holdout sample of 31 managers from partner firms. To gauge the ability of the informants to report on the variables of interest, follow-up interviews of informants were conducted. These interviews verified that the approach taken was able to identify suitably knowledgeable informants (Gilliland and Bello, 2002). The interviews were used to ascertain key informants' interpretation of the items in the measures, to ensure content validity of each measure and construct equivalence.

⁴ The Forbes2000 list of top 2000 ranking public companies was used to identify leading IT companies (www.Forbes.com). The ranking is based on a mix of four metrics: sales, profit, assets and market value. Firms were excluded if they were found not to employ certified partners.

In total 151 complete responses were received, representing a response rate of 21%. The average length of experience with the supplier was 3 years. 41% of the partners had been in a relationship with their supplier for more than five years. Out of the completed surveys, 61% of the partners had less than 100 employees and 21% had between 100 and 500 employees. To assess non-response bias, early and late respondents were compared (Armstrong and Overton, 1977). The results of t-tests revealed that there is no significant difference on the constructs, or on demographic variables such as number of employees between the two groups indicating that non-response bias does not pose a significant problem for our research.

Analysis

Analysis and assessment of the psychometric properties of the measurement model followed procedures commonly employed in the literature. Exploratory factor analysis was conducted on all manifest variables to provide evidence of discriminant validity. The analysis provided a correctly loading solution. Harman's single factor test was used to assess common method bias. The factor accounted for less than half of the total variance (38% of 77%). To further validate the measurement model confirmatory factor analysis using AMOS 23.0 was undertaken. For a 5-factor model the model fit indices are $\chi^2 = 204.6$, $\chi^2/\text{df} = 1.64$, CFI = 0.95, RMSEA = 0.06 which suggests the measurement model is acceptable (Hair et al., 2014).

Following Sumo et al. (2016) PLS-SEM was employed rather than covariance-based modelling (CB-SEM) due to the complexity of our model. The inclusion of 2-way and 3-way interaction terms increases the complexity of the model. When there are a large number of items per latent variable, as in the case of product indicator interaction terms, CB-SEM increases the total number of parameter estimates, possibly leading to model identification and convergence issues (Peng and Lai, 2012). Compared to CB-SEM techniques, model complexity does not pose a severe restriction because PLS modelling only estimates a subset of parameters at any moment (Wetzels et al., 2009). This leads to a successful estimate of the

factor loadings and structural paths for each individual subset and PLS-SEM is suggested as a valid alternative to CB-SEM (Peng and Lai, 2012; Reinartz et al., 2009). PLS thus readily accommodates complex relationships in the structural model and it does so effectively with a relatively small sample size in comparison to CB-SEM (Sarstedt et al., 2016). In addition, the model included a number of single-item control variables, which PLS-SEM (but not CB-SEM) would process without identification problems (Hair et al., 2014).

Coefficient α and composite reliability were calculated for each construct in the measurement model and were found to be greater than the recommended minimum of 0.6 for the first two measures, indicating acceptable reliability (Chin, 1998; Hair et al., 2014). Average variance extracted (AVE) for all latent variables was found to be above the minimum of 0.5. The standardized loadings from the PLS-SEM model were acceptable providing evidence of convergent and discriminant validity (Chin, 1998). Discriminant validity was also assessed by examining whether each construct shared more variance with its measures than with other constructs in the model (Chin, 1998). To this end, AVE was always greater than the highest shared variance with the other factors, indicating discriminant validity. The results demonstrate the reliability and validity of the measurement model. Correlations between all latent variables are shown in Table 1 and the loadings are shown in the Appendix.

*** Table 1 About Here ***

The results for the hypothesized structural model are shown in Table 2. A hierarchical approach to variable inclusion was followed where first a direct effects model was tested (Model 1). This was the base model. Next, the two-way interactions between all relevant variables were added to create model 2. Last, this was followed by the insertion of the 3-way interactions to create model 3. To test for the interaction effects in the model, interaction terms were developed using an orthogonalizing residual product indicator approach as follows: First, product terms were created between all indicators of the relevant constructs. Second, the

product terms were regressed on all the indicators and third, the residuals were used as indicators of the interaction term (Henseler and Chin, 2010). This limits multicollinearity amongst the interaction terms. Checks revealed that the variance inflation factors of the latent variables in the structural model are less than 2, suggesting that multicollinearity is not an issue in this data (Hair et al., 2014).

*** Table 2 About Here ***

To assess the quality of the model, a goodness-of-fit (GOF) measure ($\sqrt{\text{average } R^2 * \text{average AVE}}$) was calculated. Assuming a large effect size for R^2 (0.26) and a cut-off value of AVE of 0.70, a comparison GOF value is 0.42 (Tenenhaus et al., 2005). The goodness of fit calculated was 0.55, indicating a good fit. In addition, Q^2 was calculated for the outcome variables to assess predictive validity. This was 0.22 for relationship embeddedness and 0.42 for relationship performance. The fact that both of these were above zero indicates that the model has predictive relevance (Tenenhaus et al., 2005).

Results

According to the results in Table 2, partner network structure has a direct effect on relationship performance ($\beta = 0.27$)⁵. Partner network structure also has a strong positive impact on relationship embeddedness ($\beta = 0.36$), which in turn impacts relationship performance ($\beta = 0.34$). Together these show that relationship embeddedness partially mediates the relationship between partner network structure and relationship performance supporting the base model⁶. Partners embedded in a planned network structure accrue performance benefits

⁵ Research advocates the use of one-tailed test when testing directional and theory driven hypothesis (Cho and Abe, 2013; Phang et al. 2014). Therefore the 3-way interactions are tested using 1-tailed tests, else 2-tailed tests are employed.

⁶ A Sobel test demonstrated the significance of mediation ($t = 2.94, p < 0.00$). When, we tested a model without the mediator, the relationship between partner network structure and relationship performance was substantially larger ($\beta = 0.41$).

both directly and through the trust, integrity and cooperation afforded to them through relational embeddedness.

When we compare the 2-way interaction model (M2) to the direct model (M1): including the interaction terms, relationship embeddedness R^2 increases from 0.25 to 0.36 ($\Delta R^2 = 0.12$, $p < 0.00$). The f^2 of the interaction term is 0.17 suggesting a medium effect size (Chin *et al.*, 2003; Cohen 1988). Similarly, for relationship performance, the increase in R^2 ($\Delta R^2 = 0.05$, $p = 0.01$; $f^2 = 0.13$) is significant with a medium effect.

Similarly, the R^2 for relationship embeddedness increases from 0.36 in a 2-way interaction model (M2) to 0.38 in a 3-way interaction model – M3 ($\Delta R^2 = 0.02$, $p = 0.03$). The effect size (f^2) of the interaction term is 0.03 suggesting a small effect. The increase in R^2 for relationship performance ($\Delta R^2 = 0.03$, $p < 0.01$; $f^2 = 0.08$) is significant with a small to medium effect. These results provide support for the plural view of governance.

Significant interaction effects are also graphed in Figures 2 and 3. We followed a method prevalent in the literature (Aiken and West, 1991; Dawson, 2014). We used one standard deviation above and below the mean to capture high and low levels. When partner community governance is in place, certification can enhance the impact of partner network structure on relationship performance ($\beta = 0.17$), and *vice-versa*. This supports H1. However the results are starker. Both certification and partner community governance reduce the effectiveness of a partner network structure in driving relationship performance without the support of the other governance mechanism (Figure 2). It is the interplay of both certification and partner communities that lead to performance enhancements.

*** Figures 2 & 3 About here ***

The impact on the *network structure – relationship embeddedness* relationship is less straightforward. The significant three-way interaction ($\beta = 0.14$) supports H2a. Without certification, partner community has a limited effect on the extent to which partner network

structure drives relationship embeddedness (Figure 3). Certification enhances the usefulness of a partner community. However the effects of partner communities go even further. Certification without partner communities has a negative effect on the *network structure – relationship embeddedness* relationship. The introduction of partner community governance can remove this detrimental effect.

However the 3-way interaction between relationship embeddedness, certification and partner community on relationship performance is not significant ($\beta = -0.10$, *n.s.*) thus failing to provide support for H2b.

Further understanding of the impact of certification and partner community can be uncovered by looking at the 2-way interaction model (M2). On its own certification governance did not enhance the impact of structural embeddedness on relationship performance. Certification failed to moderate the relationship between partner network structure and relationship performance ($\beta = -0.06$, *n.s.*). The darker side of certification is evidenced by the negative moderation of the relationships between partner network structure and relationship embeddedness ($\beta = -0.29$); and between relationship embeddedness and relationship performance ($\beta = -0.16$). This suggests that the procedural effects of certification are not that pronounced and that the relationship effects are rather detrimental.

Conversely, partner community fails to moderate the relationship between network structure and relationship performance ($\beta = -0.08$, *n.s.*). In contrast to certification governance, under partner community governance the *network structure – relationship embeddedness – relationship performance* relationship is strengthened. Partner community governance positively moderates the relationships between partner network structure and relationship embeddedness ($\beta = 0.27$); and between relationship embeddedness and relationship performance ($\beta = 0.13$). These results demonstrate the significant relational effects of partner communities. It is through this that relationship performance is enhanced.

Discussion and Implications

Motivated by IT suppliers, such as Microsoft and Oracle's, struggle to manage their partner networks effectively, we set out to investigate the effects of two network governance mechanisms - namely certification and partner communities - on the link between embeddedness and relationship performance.

With respect to our first hypothesis, we find strong support for the plural form of governance. In order to attain maximum benefits from their partners, suppliers should use both formal and informal governance mechanisms (i.e. certification and partner communities), to support their network. Suppliers in the IT sector faced with network overload as a result of attempting to control a dispersed network of tens of thousands of partners have introduced two mechanism to maximise the performance of their partners. Suppliers certify their partners and provide communities of practice to support them. The governance of partners is a crucial issue in the IT sector, as suppliers have to adopt a broad overview of their entire structural network. It is not only the capabilities of the partners, but also their position in the market that determines performance. In addition, these partners are the final link between the suppliers and the consumers, putting them in a critical position. Thus, effective governance is critical in achieving desired results.

The synergistic benefits of deploying both certification and partner communities, we contend, can be attributed to the interplay between the explicit knowledge shared via the certification process (Kalyanam and Brar, 2009), and the tacit experiences shared in partner communities (Anand et al., 2002). This tacit knowledge provides a narrative and contextual framing that enables partners to overcome cognitive barriers, assimilate and make full use of explicit knowledge. At the same time, certification reduces information asymmetry between partners (King et al., 2005) which reduces free-riding, enhances voluntarism and reciprocity, thus increasing the likelihood of sharing tacit knowledge in the community (Mathwick et al.,

2008). Thus together partner communities and certification enhance the relationship between structural embeddedness and relational performance.

We report support for the argument that certification and partner communities jointly and positively moderate the relationship between partner network structure and relational embeddedness (H2a). This suggests that certification and partner communities elevate each other's benefits and helps develop a stronger bond between partners and their supplier. On one hand, partner communities complement certifications by creating a sense of community while countering the sense of monitoring created by certifications (Bell et al., 2009). Certification can increase conflict and increase relationship-damaging behavior (Brown et al., 2009). Yet, partner communities develop a sense of fairness and commitment (Weber, 2001), operating as a social control buffering against, and neutralizing, a partner's potentially negative sentiments and adverse reactions to the certification process. Furthermore, certifications signal that the partners belonging to the network have similar baseline capabilities. The signal that the partners 'belong to the same club' increases their credibility thus supporting the relationship-building in partner communities (Grabner-Krauter, 2009; Markus and Agres, 2000). Together, they help suppliers to improve the relational embeddedness of the partner network structure. These results may partially be driven by characteristics of the IT sector: certification is most common in this sector and unlike those, such as ISO 9000, used in other sectors, it is applied to all partners. In addition, partner communities are very prevalent in IT industries. The long history of these communities in this sector and the repeated experiences of the partners with them, is possibly helping partners recognize their informational and relational benefits.

We find that certification and partner communities do not have an interactive effect on the performance implications of relational embeddedness. Evidenced by the non-significant results for hypothesis 2b. It may be that certification diminishes the positive effects, such as perceptions of transparency and fairness, generated by partner communities (Yu et al. 2006).

The monitoring and oversight elements of certification could be viewed as a violation of the social norms, trust and integrity embodied in relational embeddedness. An alternative explanation may be that relationships which are considered to be closely bound do not benefit as expected from certification, and the socialization embodied in partner communities, is not enough to offset the negative perceptions of this auditory, evaluative process.

Greater insight into the role of certification and partner communities may be gained by drilling down to the 2-way interactions. The results show that certification and partner communities work in opposite directions when it comes to the relational aspects of partner networks. We find support for the dark side of certifications, whereby, if used in isolation, they may represent a coercive tool that weakens the fabric of interorganizational relationships (Gilliland et al., 2010). The results show that certification negatively moderates both the relationship between structural embeddedness and relational embeddedness and that of the latter with relationship performance (see Model 2, Table 2). This result can be compared to previous studies that report that the more a relationship is formally monitored, the more opportunistically the monitored party is likely to act (Brown et al., 2016). Similarly, formalized governance structures (such as certification) have been linked to the withholding or distortion of information (Koza and Dant, 2007). This helps to explain why certification, if used in isolation, undermines the effort that has went into planning a network of partners and degrades the relational ties that bind them.

Extant research has shown that through ongoing community engagement, the normative influences of the community become ingrained leading to commitment to the community (Mathwick et al., 2008). We find support for this view and show that a partner community positively moderates the relationship between structural embeddedness and relational embeddedness; and between relational embeddedness and relationship performance (see

Model 2, Table 2). Such communities create the environment for sharing tacit information by establishing a common language and rules of behavior (Jones et al., 1997).

In this study, we make a number of contributions to theory. First, our results support earlier research that suggested that the link between structural embeddedness and relationship performance is (partially) mediated by relational embeddedness (Carey et al. 2011; Kim, 2014). This is still a relevant finding to report given the nuances of this context and our unit of analysis. Embeddedness takes a unique form in our IT context, given the key role of the supplier in managing the positioning of partners within the structural network so that they complement, rather than cannibalize each other (Morris et al., 2006; Provan and Kenis, 2008). What we can infer from our results is that the support and structure offered through a well-planned partner network positively influences partner performance. This relationship works in part, through the history of interactions, shared sense of obligation, respect and commitment between partners. In other words, relational embeddedness acts a glue binding the actors in these complex networks, comprised of many partners. We also recognize that the link between the different types of embeddedness and performance needs to be considered in relation to significant contingencies, one of which are the governance mechanisms organizations employ to manage their relationships (Rowley et al., 2000).

Our second contribution relates to the governance of large-scale networks, prevalent in the IT sector, rather than individual dyads, as per much of the literature to date. Managing these networks needs more than a straightforward extrapolation of practices used to manage dyadic relationships. Our choice of network governance mechanisms also reflects the sectoral uniqueness of the IT context. This addresses the need for a more granular understanding of the relative contribution, and limitations, of different network governance mechanisms. Although certifications are heavily used as a way of influencing the partners in complex IT networks, prior research on their use as a governance mechanism is limited. Similarly, whilst increasing

attention is being placed on the impact of online communities as value adding social mechanisms in supplier-customer exchanges (Bone et al., 2015), the role of partner communities as a network governance mechanism has not been explored to date.

Finally, and perhaps most importantly, our results contribute to the plural form debate in governance research. The plural form perspective primarily rests on the supposition that formal and informal governance mechanisms work in different ways and have different benefits, procedural or relational, respectively. Thus they can be used in tandem. We extend previous studies on the plural form view by considering both the ‘good’ and ‘bad’ of governance mechanisms, specifically certification, and investigating how the use of formal and informal mechanisms as complements play out when considering both the negative and the positive. What we find is that they *should* be used in tandem: certification and partner communities, elevate each other’s strengths thus allowing suppliers leverage their partner networks to add value.

The results show that managers need to reflect carefully on their approach to governing partner relationships as some mechanisms, such as certification, can have unfavourable consequences. In addition, managers should consider how they might integrate online forums and message boards to support their partners. These communities are not only an effective medium for the sharing of tacit information which is traditionally difficult to codify and control, but they also serve as a supporting mechanism for the more formal components of these relationships, such as certifications, which can often be met with hesitancy and suspicion.

Limitations and further research

This study generates important insights into the governance of a large network of partners. We elaborate on the use of certifications in networks as a formal governance mechanism and introduce partner communities as an informal mechanism. Our data was derived from a cross-sectional survey. Yet, partner networks are social collectives that are

dynamic and develop over time. Longitudinal research designs should be used in future research to track how different partner segments (e.g., newcomers vs. experienced partners) develop over time so we can better understand the impact of different governance mechanisms in the light of different relationship trajectories (Poppo and Zenger, 2002).

Our study was conducted in the IT sector, which is a channel environment in which the service orientation and the importance of interpersonal relationships lead to the development of informal social structures, such as partner communities (Vandaele et al., 2007). This sector encompasses suppliers of both hardware and software products. Whilst we controlled for this difference, further research could explore the relative importance of certification and partner communities based on the type of IT supplier. Furthermore, certain idiosyncrasies pertaining to the setting of our research may limit the generalizability of our findings. The type of certification we examined, which was focused on training and competencies, rather than process development (prevalent in the certification of suppliers). Additional research may consider adopting a broader view of certification type, and also acknowledge that certification can be managed by third party organizations independent of the parties involved in the relationship.

Our data was collected from network partners which we believe to be entirely appropriate, given the research context (where large IT suppliers employ certification and partner communities to manage a large number of dispersed small to medium sized partners). In this context, partners are required to abide by the supplier's rules and it is therefore important for suppliers to understand the relationship implications of their decisions. Yet, given that the supplier has a significant role in setting the network structure, enforcing certification and establishing communities, understanding their perspective is important for the advancement of network governance research.

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Appendix. Items, Loadings, Scales, Reliability and Validity

Relationship Performance (CR = 0.94, α = 0.90, AVE = 0.83, HSV= 0.41) ¹					
Our business relationship with this supplier is very profitable. ²	0.86	0.51	0.49	0.24	0.31
Due to our business relationship with this supplier, our company has gained a significant share of the market	0.94	0.59	0.49	0.36	0.42
Due to our business relationship with this supplier, our company has been able to attract significant numbers of new customers	0.93	0.58	0.50	0.37	0.46
Relationship Embeddedness (CR = 0.96, α = 0.94, AVE = 0.90, HSV= 0.41)					
We have a close personal relationship with our supplier	0.52	0.94	0.37	0.29	0.34
We have complete trust in our supplier	0.59	0.94	0.49	0.25	0.33
There is a great deal of mutual empathy and respect between our supplier and ourselves	0.59	0.96	0.47	0.25	0.37
<i>We expect a long-lasting relationship with our supplier</i> ³					
Partner Network Structure (CR = 0.90, α = 0.85, AVE = 0.69, HSV= 0.29)					
The way in which this supplier manages its network of partners is very effective	0.42	0.38	0.86	0.22	0.44
The supplier has a very well planned network of partners	0.44	0.42	0.87	0.25	0.45
In our business relationship with this supplier, we have a well designated market or sales territory	0.43	0.44	0.83	0.36	0.47
Our supplier manages its network of partners to avoid them directly competing with each other	0.39	0.30	0.77	0.20	0.43
Certification Governance (CR = 0.89, α = 0.84, AVE = 0.67, HSV= 0.12)					
Our supplier requires us to have substantial resources (i.e capital, number of employees) in place before being granted certified status	0.26	0.19	0.18	0.76	0.13
Our supplier requires our employees to demonstrate a high level of knowledge (e.g via examinations, test, qualifications etc) before being certified	0.30	0.23	0.25	0.89	0.29
In order to be certified, our supplier requires our employees to undertake specified training	0.25	0.18	0.23	0.83	0.21
Our supplier regularly reviews our certification status	0.34	0.28	0.34	0.80	0.43
Partner Community (CR = 0.89, α = 0.83, AVE = 0.66, HSV= 0.29)					
Our supplier encourages us to interact and share information with other partners of our supplier	0.37	0.36	0.48	0.35	0.87
Our supplier provides useful forums (e.g message boards, chat rooms, webinar etc) for discussions between the partners of the supplier and between the partners and the supplier	0.31	0.26	0.46	0.36	0.79
Discussions with other partners are valuable in helping us solve technical problems	0.39	0.26	0.40	0.26	0.78
Our relationship with other partners of our suppliers is one of co-operation rather than competition.	0.36	0.29	0.42	0.15	0.83

¹ α = Scale reliability coefficient; CR – Composite reliability; AVE – Average variance extracted; HSV – Highest shared variance.

²All items measured on Likert scale – (1) strongly disagree, (7) strongly agree.

³Item removed during analysis.

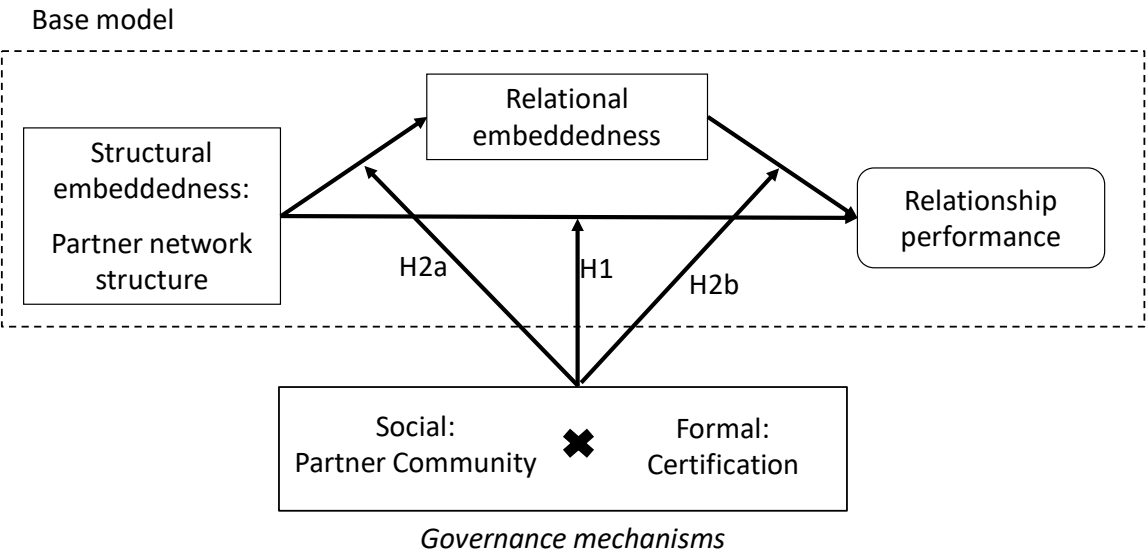


Figure 1. Conceptual Model

	Relationship Performance	A	B	C	D	E	F	G	H
A. Relationship Embeddedness	0.63*	-							
B. Partner Network Structure	0.54*	0.46*	-						
C. Certification Governance	0.36*	0.28*	0.32*	-					
D. Partner Community Gov.	0.44*	0.37*	0.54*	0.34*	-				
E. Relationship Length	0.17+	0.13	-0.08	0.16+	0.03	-			
F. Tier Level	-0.35*	-0.40*	-0.09	-0.24*	-0.13	-0.46*	-		
G. Firm Size	0.22*	0.21*	0.08	0.26*	0.01	0.32*	-0.41*	-	
H. Supplier dependency	0.32*	0.27*	0.08	0.27*	0.20*	0.28*	0.27*	-0.04	-
I. Product (hardware)	-0.11	-0.15+	-0.10	0.24*	0.09	0.12	-0.09	-0.04	0.22*
Mean (s.d.)	4.11 (1.37)	4.54 (1.74)	4.01 (1.27)	5.04 (1.28)	3.70 (1.27)	-			-

+significant at 5% level, *significant at 1% level (2-tailed).

Table 1. Latent Variable Correlations

Table 2. PLS Results

Path			Model 1 ¹	Model 2	Model 3
<u>Direct effects model</u>					
Partner Network Structure → Relationship Performance			0.27 (3.62)*	0.23 (3.16)*	0.24 (3.19)*
Partner Network Structure → Relationship Embeddedness			0.36 (3.60)*	0.34 (3.93)*	0.34 (3.77)*
Relationship Embeddedness → Relationship Performance			0.34 (3.78)*	0.33 (4.18)*	0.33 (3.98)*
Relationship Length → Relationship Performance			0.05 (1.14)	0.04 (1.06)	0.04 (0.91)
Tier Level → Relationship Performance			-0.09 (1.44)	-0.10 (1.58)	-0.11 (1.78)
Firm Size → Relationship Performance			0.04 (0.75)	0.02 (0.44)	0.02 (0.48)
Supplier dependency → Relationship Performance			0.13 (1.86)	0.08 (1.56)	0.06 (1.11)
Product (Hardware) → Relationship Performance			-0.10 (1.71)	-0.10 (1.80)	-0.09 (1.80)
Certification Governance → Relationship Embeddedness			0.12 (1.54)	0.15 (2.10)*	0.13 (2.18)*
Partner Community → Relationship Embeddedness			0.13 (1.45)	0.11 (1.40)	0.11 (1.40)
Certification Governance → Relationship Performance			0.09 (1.42)	0.10 (1.85)	0.10 (1.79)
Partner Community → Relationship Performance			0.11 (1.48)	0.14 (1.80)	0.14 (1.74)
<u>2-way interactions</u>					
Network Structure x Certification Governance			→ Relationship Embeddedness	-0.29 (2.64)*	-0.29 (2.71)*
			→ Relationship Performance	-0.06 (0.83)	-0.06 (1.01)
Relationship Embeddedness x Certification Governance→ Relationship Performance				-0.16 (1.99)*	-0.12 (1.54)
Network Structure x Partner Community			→ Relationship Embeddedness	0.27 (2.74)*	0.27 (2.40)*
			→ Relationship Performance	-0.08 (1.34)	-0.07 (1.13)
Relationship Embeddedness x Partner Community			→ Relationship Performance	0.13 (1.96)*	0.09 (1.38)
Certification Governance x Partner Community			→ Relationship Embeddedness	0.15 (1.85)	0.15 (2.02)*
			→ Relationship Performance	0.08 (1.24)	0.09 (1.64)
<u>3-way interactions</u>					
Network Structure x Certification x Partner Community			→ Relationship Embeddedness		0.14 (1.89) ^{*a}
			→ Relationship Performance		0.17 (1.99) ^{*a}
Relationship Embeddedness			→ Relationship Performance		
x Certification x Partner Community					-0.10 (1.16)
Variance explained:	Relationship Embeddedness	R ²	0.25	0.36	0.38
		F change		8.25 (0.00)	4.61 (.03)
	Relationship Performance	R ²	0.54	0.59	0.62
		F change		3.41 (0.01)	5.45 (0.01)

1. Path Coef. (t-value); * Path significant at $p < 0.05$ (2-tailed); ^{*a} Path significant at $p < 0.05$ (1-tailed)

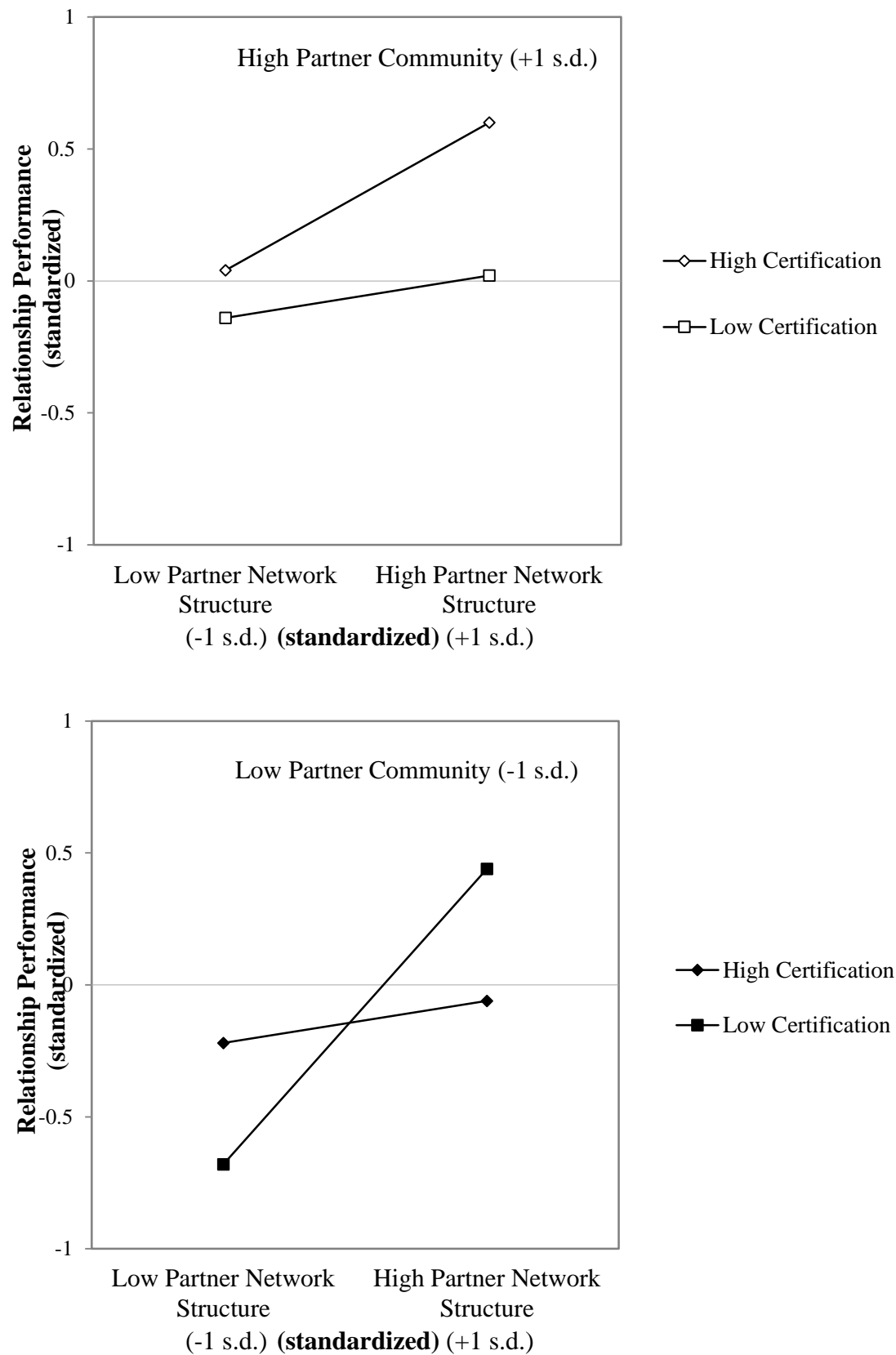


Figure 2. 3-Way Interaction on Relationship Performance

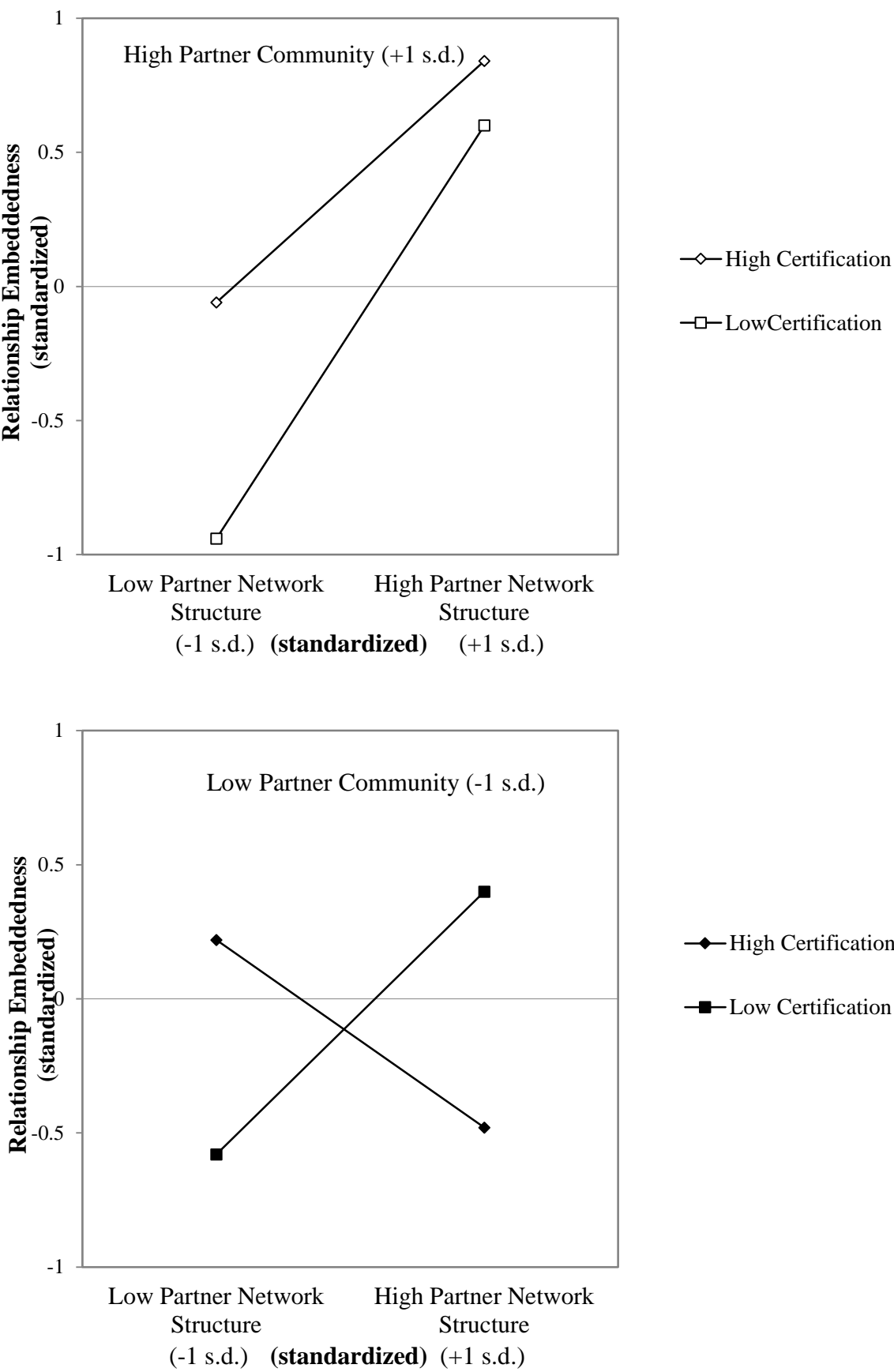


Figure 3. 3-Way Interaction on Relationship Embeddedness